

OBSERVATIONS

ON THE

TILLAGE of the EARTH.

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OBSERVATIONS
ON THE
TILLAGE of the EARTH,
AND ON THE
THEORY of INSTRUMENTS
ADAPTED TO THIS END.

By JAMES BLACK,
Of MORDEN, in SURRY.

Cunctis diebus Terræ Sementis & Messis, Frigus & Æstas,
Æstas & Hiems, Nox & Dies non requiescent.

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OBSERVATIONS

ON THE

TILLAGE of the EARTH.

INTRODUCTION.

THE happiness and strength, as well as the true riches of a nation, will certainly be found to consist in the number of men living by moderate and wholesome labour.

Such a state of the community may be obtained by a general cultivation of lands : notwithstanding all that can be urged on the subject of commerce and manufactures, on mature consideration, these will be found to be the rivers and streams originating in this common source. The corn trade, the woollen manufacture, the fisheries, indicate a previous agriculture. The voice of Nature, through a variety of concurring circumstances, is at length heard. 'Tis time to seek the fountain-head to drink pure water.

Strange questions have arisen respecting population and the fertility of soils; such as, whether a region may be worn or eaten out by the enormous number of its inhabitants?

A French author having read that Syria and Judea are at present little better than barren deserts, has concluded that these countries could never contain or give birth to the myriads of Israelites as recorded in all histories.—Others have instanced the same situation of things as a proof of their great numbers, explaining this assertion by the earth's not having recovered from a languor incurred by feeding such quantities of animals.

Of late years, agriculture seems to have been represented as a science too immediately depending on something like a process of chemistry, and accordingly we have *recipes* from a compounded dunghill down to a vegetable powder, which may be carried about in a box. Notwithstanding there still remains a great part of England, that very soil stamped with the original curse, "thorns and thistles shall it bear unto thee, until conquered by the sweat of thy brow." These are the clays, &c. the true wheat, bean, and clover lands. The turnep counties being by nature friable soils, through their lightness and facility have been tilled and produced turneps; turneps, sheep in abundance; sheep, wheat and barley; and the whole face of these counties has been changed. Thus far well conducted; but in the case of the clays, our inability, through want of method, to bring about the same ends, has given birth to that many-headed Hydra the doctrine of manures, much in resemblance to the universal nostrum of quacks to cure all diseases.

That the original idea of tilth is too much obliterated under the more obvious preparations by manures, is what is contended for, not that these have not their uses.

Therefore

Therefore the subject of the following observations will be more immediately, the means to effect good tillage equably, and the result when properly conducted; taking it for granted, that mixtures of most sorts of substances, animal, vegetable, and earthy, do produce a fermentation in a soil, which, so far as it goes, is very active to promote the ends of a vigorous vegetation.

OF PLOUGHING.

Natura multos fecit imitatores, paucos artifices.

ON the subject of Agriculture, Tull may be considered as one of the few. It seems a principle of nature, that the finer all land is pulverized, the better it will be prepared for the vegetation of plants. It is however to be understood that dust, in other words, earth deprived of vegetable moisture, is in this case deficient in the most necessary part of its composition, when considered as fruitful earth; therefore it will be found of the greatest importance, to find means of attenuating soil with the least possible evaporation of that which is the very blood of vegetables, particularly when the preparation is for turneps or other vegetables sowed or planted at a time when the sun is high in our hemisphere, and powerful to absorb the moisture necessary to their growth. The fruitfulness of soils is in proportion to their depth of equable tillage, no matter how obtained; whether by violent efforts we mix quantities of putrid dung in a soil, and ferment it as we do our strong beer, or by frequent expositions to the influences of heaven, we promote the same effects. This is understood where there is a soil; for the sandy desert cannot come under this denomination, until a certain portion of clay or virgin earth be mixed therewith.

The good sandy loams become very fruitful in many respects, but cannot be made to produce wheat or beans of the same specific gravity with that of the clays.

It still with some remains a question, whether earth may acquire a fertility by tillage alone equal to that which results from frequent dressings? with others, whether the true means to obtain a good tilth be perfectly understood?

“ In Peru, their high lands are very fertile, and produce all
 “ kinds of grain in abundance, to such a degree, that a bushel of
 “ seed-wheat produces in return one hundred and fifty, and even
 “ two hundred, but in the ordinary course one hundred. They
 “ have no ploughs to till the earth, but they use sharp spades to dig
 “ it, and on this preparation they make small holes with pointed
 “ sticks, and plant their wheat grain by grain, after the same manner
 “ we plant beans in Spain.” History of the Discovery and Conquest
 of Peru, by Augustin de Zarate, chap. viii. in 1543.—If part of
 these effects be attributed to the cause of a blessed temperature of
 climate, there will still remain much to be placed to the account of
 a well-conducted labour. The mellowness of that earth which has
 been well divided by the spade, is familiar to most men. No other
 invention of an instrument hitherto has attained to that perfection of
 tilth.

When we consider this subject more minutely, we find that, in
 order to dig a plot of ground well, gardeners begin by opening a
 trench, and carrying away the mold. By this means the plot is
 cleanly dug to the depth equal to the trench, and minutely divided.

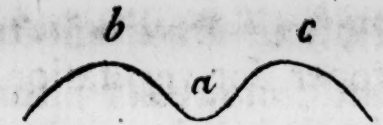
In the ordinary course of ploughing, especially on the flat, the
 furrows are turned to the depth of three inches. If on strong lands

dry weather succeeds, the whole is soon dry, and becomes thereby improper for vegetation. If abundant rains succeed, the substratum of clay being impenetrable, the water stagnates so soon as the three inches are saturated, and chills vegetation.

In the garden, consisting of the same strong soil, brought into tilth by the spade, to the depth of fifteen inches, no winter gives more rain than is requisite to saturate this depth of mold, and no summer so dry in our climate, as to absorb the necessary vegetable moisture of such a soil. Tull made these observations, and founded a system of tillage upon them. He assures us of his success; but seems to have been mistaken in attributing to a certain precision in the form of his instruments, effects arising more immediately from his method in using them.

Since Mr. Tull, few have equalled his culture; but many, in following too closely the phantom of his precision in the form of his instruments and their uses, have been led to overlook the true principles on which it is founded. For if a field has been winter and summer fallowed, and horse and hand-hoed with the greatest attention, but that it should after all be found to have no greater depth than three inches of mold, the result will of course be correspondent, an ordinary crop. On the other hand, if by a proper use of the most common instruments, a depth of good mold be obtained of eight or more inches, we have too many experiments on record to doubt of an increase in proportion. All earth should be ploughed into lands, out of furrow and into furrow, for the same reason that gardeners dig out of trenches and into them again.

Suppose a field ploughed on the flat, the first opening made by the generality of ploughs will be to the depth of three inches, and this will be the depth of the whole field. On the other hand,
let

let a field be ploughed into small lands,  whose furrows are deepened by two horse-hoeings, followed by an earthing plough, so that the furrows at *a* shall be twelve inches deep, compared with the lands *b c*: in such case it will appear to a demonstration, that by ploughing these two together, or into the same lands, with a good instrument, the field will have received a clean tilth, and consist of lands with a depth of twelve inches of mold, and by ploughing again two lands together, the same effect will arise out of the same cause; but it does not appear that the general principle has been clearly discovered, from the consideration of which, as from a fountain, the forms of all instruments of tillage are deducible. Of this in the following chapter. The free admission of the prolific influences of the atmosphere into the bosom of the earth, is undoubtedly amongst the chief means of promoting a vigorous vegetation.

Mr. Tull and his servants observed, that his wheat vegetated most strongly immediately after the hoeings, which exposed its roots and the tilth to the air.

Air is produced and circulated abundantly by the putrescence of rotten dung in a soil.

Land acquires great degrees of fertility by frequent ploughing, in other words, various expositions to the air.

The effects of ploughing are in proportion to the depth and division obtained in the soil.

Some men, by this consideration, have been induced to make great efforts with unwieldy instruments, and the power of many horses,

horses, and have effected a first ploughing to the depth of eight inches, followed by two or three ordinary ones, at the depth of four, and have lost for a time the best half of their soil; when ploughing equably to the depth of four inches, would have been attended with a very sensible amelioration.

Out of the result of such operations have arisen many questions about the depth of tillage, in proportion to given quantities of dung, &c. But it seems not less a principle of nature, that equable tillage, to the depth of eight inches, where no greater depth than four was before obtained, is an acquisition of double the soil; which will ever preserve its youthful and returning vigour, so long as summer and winter, seed-time and harvest, shall reward the farmer's toil.

In most soils such an acquisition cannot be hasty, it might be much too expensive; it should therefore be brought about by degrees as above described, and by deepening the wedges of our ploughs annually inch by inch.

The clays and strong wheat lands under the tilth, are impervious to the air and water of the atmosphere, and require all the powers exerted by the alternacies of the seasons, much more than the division by instruments, to constitute them the genial bed of nature.

*Illa legis demum votis respondit avari
Agricolæ, bis quæ solem, bis frigora sensit.*

On strong lands and clays there are very good reasons for following the Flanders method of ploughing still into thirty-three feet lands, equal to half an acre; and Mr. Tull's observation of laying these diagonally.

diagonally to the greatest fall of the hill, is unquestionably founded on real advantage.

If the farmer aims at making soil, let him strike these into seven lands, with the double-mould board plough, then hoe the furrows, and strike them up twice or thrice: if he chooses to have a crop on the land while he is hoeing, he may or not; either way it will answer his end; he will raise a tilth, and warm his land. For if in time the means of ploughing equably to the depth of twelve inches, by raising the angles of shares, or deepening their wedges, be obtained, there can be no doubt of a proportionable increase, and but little of the means.

From these premises, no system is intended to be deduced about the nutrition of plants, by air or water, or dung, or virgin earth, or sand; but that it appears beyond a controversy, that an equable depth of good tillage is in a prime ratio with constant fertility, and that to obtain this in the field, there exists a necessity of ploughing out and into furrows of your intended tillage, as gardeners dig out and into trenches of one or two spitts.

OF PLOUGHS.

A PLOUGH is a moving wedge to divide and overturn; it should therefore be constructed according to the laws of moving bodies. These, according to Sir I. Newton, are,

1st Law. That every body will continue in its state of rest or motion uniformly in a right line, unless it be made to change that state by some force impressed upon it.

2d Law.

2d Law. That the change of motion is proportionable to the moving force impressed, and is always according to the direction of that right line in which the force is impressed.

3d Law. That reaction is always equal and contrary to action; or, which is all one, the mutual action of two bodies one upon another are equal, and directed towards contrary parts; as when one body presses and draws another, it is as much pressed or drawn by that body.

From the consideration of these laws it will follow, (See Plate VI.) that the angle DFE, or its opposite equal to it AFC, represent the *Vis inertiae*, and BFD, or its opposite CFG, the force impressed. These two angles make up forty degrees *. Let the *Vis inertiae* be = 1, and the force = 2, we find the 2 : 1 : 40 : 20. Thus the angle of the wedge will give us the true direction of the applicable power and consequent length of the beam.

This line formed by the angle of the wedge, is to be carried in a right direction to the point of force applied, (see plate II.) where it is carried to the Ox's ear where it joins to the yoke. This consideration, combined with the length of the beam and iron copse-

* The *vis impressa* may be considered every instant in the plough, communicated to it by the cattle; the *vis inertiae* principally in the resistance of the medium through which the plough moves: because the specific gravity of the plough is but trifling, when compared with the gravity, the attraction, and viscuosity of the soil; for in ploughing on a strong soil at four inches depth, the plough has been observed to be = 200. But the ploughing required a force = to four to six thousand weight.

Therefore if we consider the *vis impressa* = 1. *vis inertiae* = 1. reaction being equal to action at every instant of time, it is 1. — 1. But in order that the plough be moved, it must be considered 1 + 1 — 1 = 1. which is the equable motion, or force two to one of the resistance.

C

head,

head, will constitute the bounds of the possible wedge. The space required for horses or oxen to walk in conveniently being nine or ten feet, and the point of force applied from three and a half to four feet perpendicular above the horizon. The denser the medium through which the wedge is to move, the less should be the angle. In practice 'tis found, that the strongest clay may be divided by a wedge of twenty degrees, and as the tilth lightens, twenty-five degrees will perform the work.

The wedge is more particularly the share from its point to the hole of the false coulter. The perpendicular height of the share at this hole is its depth, in the plough (plate VI.) it is four inches. The mold-board is so adapted as to continue the wedge to a depth of eight inches, and this will be the uniform depth of this plough's work, independent of the holder. 'Tis found by experience, that thus a plough may be formed to work equably to twice the depth of its share.

If a plough be required, whose uniform depth shall be twelve inches, (see plate II.) in this case the angle of 20 is preserved, the share is lengthened so as to have a perpendicular height of six inches at the coulter-hole. The beam is kept as low as possible, that the angle of 20 may not rise above the required height of three and a half or four feet, at the distance of nine or ten feet before the end of the beam. As it is impossible to follow mathematical precision in the construction of instruments, the copse-iron moveable head is adapted to lower the angle of 20, if necessary, by a parallel.

The deviation of the beam out of land, is the medium between the angle of the *Vis inertiae* and the progressive line of the cattle; as this cannot be obtained in practice, the notches and the hand of the plough-holder are the remaining means of the equilibrium.

This

This plough drawn by a proper force, will plough up a lay equably to twelve inches depth.

It has been generally the practice to adapt wheels to such strong ploughs. Let us examine to what purpose. Suppose the beam in the small figure (plate II.) lengthened, and a wheel adapted as expressed, let the draft be according to the angle of 20 , centering in the point of force applied under the Ox's ear, it will appear on the bare inspection, that when the Ox draws, the wheel will be carried along by the tension of the draft; in this case, the wheel becomes evidently an incumbrance. If the force is applied at D , the beam will be steadyed to its angle 20 of vis inertiae, which is to be expounded by the squares of the triangles cdf , epf . From this reasoning it is proved, that the use of wheels adapted to ploughs, took its rise from an ignorance of the principle of their construction; for suppose a smaller wheel at f , and the draft at D , then this wheel will again be carried along, a useless incumbrance.

In the construction of a plough, the share is the first object into which the ground-piece is to be perfectly introduced, and to be of the height of the highest part of the share. Next the beam, according to the angle of the share, allowing for what advantages may be gained by a copse-head. The mold-board may easily be designed, by tracing a parallelogram over the plan of your intended board, which requires to be more or less open at the heel, in proportion to the tenacity of the soil it is to work upon, most open on the stiffest clays, and least on the lightest lands.

There are soils so very stony, and consisting of such a viscous clay, in other words, in such bad tilth, that it may perhaps be necessary to steady a pointed share, at the expence of wheels, until it be subdued into a more kindly soil; but the constant uniform

practice of adapting wheels to ploughs, particularly in the lighter soils, cannot be defended. Of the forementioned stony clays, the observer has had no personal experience.

Of the Double Mold-board Plough. Plate IV.

This plough is subject to the same principles as above described: its use is to strike the tilth into lands by tracing furrows. The finer the mold where it is to work in, and the higher it is intended to be struck up, the wider the boards should spread in form at A B, where they are in contact with the fins of the share. These boards are to be designed by tracing a parallelogram on their plan. An elm piece of seven inches thick will make them, and a mold for the top, and one for the bottom, will be the sure means of making them perfectly alike, which they should be, to ensure the steady going of this plough. Iron is more durable than wood, perhaps not more expensive in the end, but is apter to be retarded by the adhesion of the soil in wetting weather.

Of the Sowing Plough.

Plate I. exhibits an exact design of this plough, constructed on the forementioned principles, and withal of a strength and solidity to resist the work of tracing small furrows in the stiffest clays, for the purpose of sowing beans, or any other of the smallest seeds.

In the pursuit of an idea on the subject of the delivery of seeds, in an equable manner, without friction or bruising, it occurred, that the inclined plane of a cone would answer the end proposed. Let us suppose a vessel, wherein grain of any specific gravity is contained, let it have an aperture proportionable to the size and quantity intended to escape through it, stopped by a cone; it will follow,

follow, that such part of the seed as shall rest on such inclined plane, will fall the instant the cone is lowered below the contiguous sides of the aperture, without a possibility of arching, to which most kinds of seeds are inclined.

Practice has justified this theory. The cones in their diminished proportion, as in the plate, would deliver tobacco-feed by half a dozen at a time. There is no axis but that of the handle A, which is moved up and down by a child walking along-side the plough. The cones, and their correspondent plates, may be made of pear-tree wood, or any other similar to it, and varied ad infinitum as to diameter, but still preserving the same axis of one half inch; by this means, the motion of one half inch may open the cones of all diameters. By practice we find it better not to open the whole half-inch, but rather to use greater diameters. Of these we may judge, by placing the number of seeds we intend to escape round the cones.

We can regulate the motion two ways, first by turning the pin, which connects the cone to the jack-head and spring by a gut cord; secondly, which is the best way, by putting a bit of cork-wood in the conductors, under each end of the cylinder, which lays on the top of the jacks.

Under the cone is represented a little travers of wood to regulate it, and lowest a common musket bullet to stretch the cord, on account of the small gravity of the cone.

The whole apparatus may be taken from the plough in five minutes, and repaired if needful, which can but rarely happen; for after sowing fifty acres the shares were worn, but the system for the delivery of the seed remained the same as it was originally.

The

The coupe, as represented at A in this plate I, is exact, and therein is expressed every part of the system for the delivery, according to the general scale adopted to express the proportion of these instruments of $\frac{1}{100}$ parts of a foot = 1 foot, because this division is to be found on all rules. The conductor, which is defended from injury by the clods, by means of two small boards, is made of white horse leather, on account of its obvious cheapness, and the vessel to contain the seed of tinned iron.

If a plough should be required to sow more than two rows at a time, which perhaps is needless, more shares and ploughs may be added, and the cylinder extended to a proper distance. This is left to the consideration of others.

Of the Horse Hoe. Plate V.

The use of this hoe is to destroy weeds growing near the rows of beans or other crops, and to throw down the mold from them towards the furrows, that they may not be buried by it, which is to be returned by the double mold-board plough. It is constructed according to the fore-mentioned principles, as will appear more clearly by the plan. Suppose the line A H given as the progression along the side of the row, likewise given the line D I, parallel to it at 27 inches distance, the path of the impressed force, the angle B A C, or its opposite, the vis inertiae; the angle C A D, or its opposite, the angle of applicable force, these two make together 48 degrees. Let power be 2, and vis 1, it follows $2 : 1 :: 48. 24.$ which is at C. But as this line must be carried in a right direction, until it coincide with the line D I, and there form the true point of impressed force, it would follow, that the cattle would be at too great a distance from their work, which is always a loss, on account of the progress of power, which is like other things

generated in time. Therefore this is rectified by means of a copse-head, producing parallel K M, which will be found to coincide with D I, at the proper distance of about nine or ten feet from the end of the beam, leaving a proper space, and no more for the cattle to work in.

It is to be observed, that by the construction, the beam and handles are made to slip more or less into land by means of the two iron pins, which connect the hoe with them, as per plan.

Likewise that less or more depth may be given to the angle of the hoe, by the same pins, as appears by the elevation.

From the foregoing observations, founded on practice, it follows, that a line and plummet, and a semicircle, graduated to 180 degrees, are as necessary guides to the ploughwright, as the loadstone and needle are to the mariner.

C A B B A G E T U R N E P.

THIS plant, which was first cultivated in England by Mr. Reynolds, of Addisham in Kent, and with a laudable public spirit communicated by this gentleman to the public, is a most valuable acquisition in agriculture for many reasons, which have been deduced at large by him.

It certainly is a fattening wholesome food, particularly for oxen, cows, and sheep, and stands invulnerable against the severest influences of the weather in all seasons. It will grow in any soil well tilled, from a sand to a clay, when planted about midsummer. If the plants are of a proper size, as per plate VII. it will outlive the
greatest

greatest drought until rains come, and then vegetate with a redoubled force after every hoeing. No weather hurts it through winter, and it remains when all fodder is used, to supply March, April, and May with provender. Half an acre of fresh earth, sowed in fine tilth about the latter end of March, will produce about one hundred thousand plants; at seven thousand to an acre, is about fourteen acres. When the plants are rising out of the seed, they should be dressed with fresh lime, or ashes, or soot, to drive off the fly, and hand-hoed at least twice or thrice; if obtained to the size as expressed by the plate, nothing can hurt their growth when planted out about midsummer. The plants alluded to in the plate, and planted according to the Chapter on improvement of Land, grew to the size of six to ten pounds, the root alone, exclusive of the greens.

EXHAUSTING CROPS.

EXHAUSTING crops are such, as remaining longest on the land without a possibility of giving it tillage, thereby leave room to the earth to subside into that compact substance which impedes vegetation.

On this account, wheat followed by spring corn are deemed such, less or more, according to the species of spring crop; peas or beans being tilled, redeem in part the deterioration by the wheat; therefore after wheat, oats are ranked as the most exhausting crop. Clover is said not to be an exhausting crop; its numerous roots and fibres divide the soil; its thick foliage defends the earth from the battering of sudden heavy rains; the heats of summer, joined with moisture, produce a fermentation genial to the earth. Hence all observers agree, that clover mowed to three tons per acre, exhausts less than fed clover. What is meant therefore by the exhaustion of a soil?

a soil? Certainly its deprivation of earth, or of the mechanical division of it, so as to impede the flow and unheeded motion which constitutes vegetation.

VIRGIN EARTH.

EARTH buried at a depth below the immediate influence of the air, is observed by a sudden exposure to dissolve into a friable soil, and thereby becomes soon disposed to be the genial bed of nature. This accident happens to clays, and to marles, a species thereof, more immediately. Hence both are found useful improvements, particularly to sand, which is deficient in the point, that it is not earth.

Gardeners sift this mixture of sand and clay on cucumber-beds, and call it virgin earth.

Minerals are generated in soils, and seem to hinder the vegetation of plants. Perhaps, in this instance, rotten dung may be found to be of the first necessity.

OF SOILS.

WATER will reproduce wheat, water and sand *a fortiore*; because both sand and water are not found destitute of earth.

Sand, and clay, and water, mixed in various proportions, produce wheat, until you arrive to the purest of all earth, saponaceous clay; which seems barren on account of its viscuosity and adhesion, by the strong attraction of myriads of particles, without the interruption of

D

dissimilar

diffimilar particles, such as may be sand, vegetable substances in a state of rottenness, mineral ores, testaceous powders, gravels, &c. according to the variety of these cases, seems well founded the assistance of mixtures of dung, of calcareous earths, of sand, clay, lime, ad infinitum.

By mixtures of all sorts, flow and unheeded motion is generated, and motion is the life of the creation.

On the CLEANING and on the IMPROVEMENT of LAND.

SUPPOSE a piece of lay-land foul with quitch-weed, from a barley-land to a clay, to be retrieved, and brought into tilth and heart.

First, if it is in lands thus,



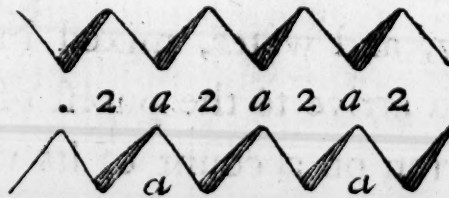
1st, Let these two be ploughed together, beginning in the furrow A, as deep as may be, any time in winter or autumn, before January.

2dly, When thoroughly dried by the easterly March winds, let it be harrowed well.

3dly, Let it then be cross ploughed.

4thly, And well harrowed.

5thly, Let it be ridged, as intended to lay, by the double mold-board plough, sticking the point of the share in at every two feet distance, by means of a gage.



6thly, Let it be rolled and harrowed lengthways of the ridges to make it as fine as possible.

7thly, And struck up again with the double mold-board plough.

8thly, Let the furrows *a, a*, be dunged, leaving an intermediate furrow undunged. This may be done with seven, to seven or eight tons of dung per acre.

9thly, Split all the furrows with the double mold-board plough.

10thly, Roll and plant the cabbage-turnep on the lands *a, a*, any time before the end of June, to have the benefit of the midsummer rains on the plants.

From henceforth horse-hoe and strike up the furrows, as often as time and opportunity will serve.

This crop will come in for spring food in April and May following, when it is more wanted than at any other time in the year; and the crop may run from ten to thirty tons per an acre, exceeded in quality by no other root except the carrot.

These operations seem to amount, at first sight, to a Herculean labour, because of their number, but the attentive will not thus suffer themselves to be deceived. 'Tis to be observed, there are but two clean ploughings in the whole, which require all the attention of the ploughman, and force of his cattle, operation 1st and 3d. Next is the first ridging, which requires both strength of cattle, and care in the ploughman, to make his 'bout ridges as equal as possible; but this is all mechanical, and the use of the best plough will always be imperfect in the hands of a new holder. But patience is a

fine thing, it can remove rocks, and bend the knotted oak, more effectually than the lyre of Orpheus.—Operation 5.

Next operation in difficulty is the splitting, but in this much of it is removed by the cattle going double, each beast walking in his own furrow, while the plough splits the intermediate ridge.—Operation 9.

The remaining operations are but a most agreeable amusement, the hoes requiring but a small power, may be multiplied, and likewise the harrows, as the tilth encreases.—What becomes of the quitch grafs? Its roots, exposed to the keen frost, are blighted in part; they revive in spring, but are then again disturbed by the cross ploughing; the harrowing gives them foil, and they grow again; disturbed by the ridging, they grow again in another sense; by the harrowing and ridging again disturbed; in fine, this plant is so vigorous, that it will grow itself to exhaustion by the time the turneps are planted, who themselves are most vigorous growers. These are not dreams but practice.

The turneps being fed off by June, the lands will then be about four feet and a half, or fourteen to the acre; it may be ploughed into the same lands, and planted again with the same turnep on one ploughing, or sowed with the sowing-plough with common turnep-feed; or sowed with tares to come in late; or ploughed twice, and sowed with wheat. If it is wheat and bean land, it may be ploughed once in the summer, and kept occasionally hoed and ridged until the succeeding spring, to receive a clean ploughing into the same lands, and be sowed with beans by means of the sowing-plough, a double row on each land of four feet one-half, to be succeeded by wheat
and

and beans through all succession of time, dunging for the beans in winter time, if it should require it. If peas and barley land, peas and barley dunging for the peas, hoeing and ridging every crop. Why not? Are there not vineyards, olive-yards, hop-yards, apple and pear orchards? why not wheat and bean fields, barley fields, &c.

What is it that makes fresh earth fruitful? is it not the accumulation of the influences of the elements which remain on the superficies, without a possibility of penetrating deeper? Fresh sand is not so. Has Nature sickened? Is she in danger of death, unless relieved by our nostrums? Has the sun abated an atom in his regular period? Have the former and latter rains miscarried? Has the easterly wind failed of returning at his appointed season, to dry the earth? Are there not ox lands? Can the art of man prepare an ox-fattening grass-land, by means of his compounded dunghills? *Que sçai je? Et qui pourroit tout dire sans un mortel ennuy?*

ON LABOURING CATTLE.

THE horse is the most powerful, active, and spirited in his services to man, on the one hand; but on the other, the most expensive in his keep, and subject to disease, of any of the domestic animals.

The ox is powerful, patient, and hardy, slow but diligent, able to put up with the coarsest fare, and capable of repaying for the richest feed, and of a strong constitution of body.

The medium price of team horses in England, cannot be estimated at less than fifteen to eighteen pounds for each horse.

The

The price of good working oxen, at rising four or five years, may be estimated at 10*l.* a 16*l.* per pair; they can give us their labour three or four years, and increase in value during that time. When fatted, they produce in the community a real fund of 30*l.* to 40*l.* out of the same materials which would have been necessary to maintain one horse, who in ten years time becomes worn out and of no value.

Horses devour much hay and corn; oxen eat, and afterwards masticate by chewing the quid, and the result seems to be in proportion.

Let it be granted, for the sake of argument, that the labour of two oxen shall only equal that of one horse, which is not true in practice, (oxen, well-conducted, being able to cope with the generality of farming horses in the uses of tillage) how would the account turn out?

Account of horses, fix in a team.

Six five-years-old horses cost 16 <i>l.</i>	-	96	0	0
Four years keep in hay, straw, and				
oats, shoeing and harness, at 20 <i>l.</i>	-	480	0	0
		£. 576	0	0

Deduct.

Labour, at 10*s.* per day, for six horses

four years	-	600	0	0
Value of horses at nine years old	-	60	0	0
		£. 660	0	0

Profit in four years	=	84	0	0
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		£. 660	0	0
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Account

Account of Oxen.

Twelve oxen at five years old, cost	96	0	0
Four years keep, and fattening one year, at 21% per pair for four years	-	504	0 0
		<u>£.600</u>	0 0

Deduct.

Four years labour, allowing a pair of oxen for one horse	-	600	0 0
Value of 12 fat oxen, which cost 8% apiece at five years old, 20% apiece	-	240	0 0
		<u>£.840</u>	0 0

Profit in five years by oxen	-	240	0 0
		<u>£. 840</u>	0 0

The use of numbers does sometimes deceive; but in the case before us, the clearest facts may be adduced, to support the system of labouring oxen in preference to that of horses.

It will be found, that in the first four years of a clay farm, the allowance for the loss on horses is not exaggerated; their keep will vary with the different situations, but this will be found to correspond with the price of their labour. 'Tis true, that in Hampshire, Wiltshire, and other counties, farmers buy three years old horses, which they work three or four years, and then sell them to advantage for coach cattle. But in this case, much attention is required to their keep, and not to over-work them or strain them; circumstances which can by no means be practised in the breaking up and cleaning strong lands, which make up a great part of the best wheat-lands of England, when properly subdued and brought into
tilth:

tilth : and after all this can be considered as no general system, but merely as a partial one, confined to some districts.

There are tracks of country in Yorkshire, and other counties, where horses may be bred to advantage, and to various uses ; but such particular cases can by no means affect to disprove the real advantages which would be consequent on the general use of oxen, to all the purposes of tillage.

In the account of oxen, their original cost is stated at a much higher price than that at which they may readily be purchased in many counties, and their keep and labour will be found to have been rated in a very near proportion. The largest oxen have the run of the best fatting lands in Aylesbury Vale, from old Lady-day to old Michaelmas, for sixty shillings a piece ; add to this ten weeks at hay, in which time they may eat one ton a piece, and such ox will be completely fat, after having given us his labour, on grass, hay, and straw, without one grain of corn.

It may not be improper to consider 150 acres of strong wheat land, tilled by six horses, their annual expence considered.

Hay through the year, one day with another, 15 pounds

per day for each horse, say 3 tons, = 18 tons,

6 horses, at 3/.	—	—	—	54	0	0
Chaff, or 6 tons straw	—	—	—	6	0	0
52 quarters of oats	—	—	—	40	0	0
Farrier	—	—	—	9	0	0
Loss in value, accidents, 10 per cent. on prime cost,						
supposed 100/.	—	—	—	10	0	0
				£. 119	0	0

In these counties, the annual expence of a team of six horses cannot be estimated at less than 120/. They are generally worn out in ten years: add to this a true consideration, which is, that such a farm cannot be properly tilled by this number.—Granted, good farmers do practice a system of bringing clover or tares, &c. into racks in their yards, or stump out their horses with foot-chains; but there is no part of this œconomy which is not equally applicable to oxen, with the advantage of a total saving of corn in this case.

The same 150 acres of wheat-land, tilled by twelve oxen, under the Roman yoke, their keep considered.

During the summer-work, oxen require but very little hay, added to the run of a pasture; be it ever so rough or breaky, they will find there their subsistence. Many farms have appendant commons; their deficiency may be made up by clover, lucerne, sainfoin, or green tares, brought into the yards or pastures.

From Hollantide to Candlemass, little can or ought to be done in the tillage of strong land. If manures can be had from adjacent situations, so as to pay for more liberal keep, they may be thus employed to good purpose; if not, any rouetty rough ground, or appendant common, will keep them in the day-time, provided they be tied up at night in a proper ox-house, and allowed four trufs of fodder-straw.

Four trufs 100 days, is 400 trufs, or 12 loads, at 15s. 9 0 0
During spring-work, from 10th of February to 10th
of May, fifteen tons of hay will keep them, at 3/. 45 0 0

54 0 0

E

From

From May 10 to November 1, they may return to clover, tares, and pasture-grounds; all systems of œconomy less or more perfect, in proportion to the diligence and understanding of the husbandman.

At seven or eight years of age, they may be worth nine to fifteen pounds apiece for fattening, according to their beauty and growth.

At this period the farmer may have it in his power to fat them himself, and thus sell off his own produce from four to ten pounds, which is generally most profitable, on account of their dung left on the farm. Young steers should be saved on the farm every year, to renew the teams, which may be done consistently with œconomy. The aforefaid are three epochas, at which the farmer can circulate his capital. Circulation is the blood of the community, it nourishes as it flows.

Oxen trained to the Roman yoke, can perform any work required, or possible to be done by horses, to the ends of tillage or conveyance of goods. Very stony land, or gravelly roads, when much broken, are the only possible objections to a general use of oxen; the gravel and stones working in betwixt their claws, do sometimes lame them: but these injuries may in a great measure be avoided by broad and strong cues.

In yoking oxen with the bow, the resistance is at B, and they are obliged to bend their noses quite to the ground to form this point; if they did not, the ring of the bow, which goes round the neck, would bear against the shoulder, and chafe them: besides, this part of the bow is made slight, as evidently not intended for any effort of power.

The

The natural ease with which oxen exert all their powers under the Roman yoke, is obvious to every attentive observer: this may be further illustrated. 'Tis presumed that the main strength of this animal, will be found to consist in the muscles and sinews of his reins and back, and their continuation. Their series is extended from A to B, their continuation quite to C. In the case of drawing with the bow, the opposition to the load is at B, where a callosity is formed thereby; in the case of the Roman yoke it is at C. It appears, that in the first case their power may be called A B; in the second, A B C.—Practice confirms this theory.

The callosity on the neck cannot be formed without pain and inconvenience to the animal, and perhaps an impairing of the muscular series. Collars and harness have been adopted by some, but it seems that their use is attended with more difficulty and less advantage than that of the bow, to say nothing of their expence. Collars made of soft materials, are observed to heat and chafe oxen. Some ingenious gentlemen have adapted hard polishable wood to the shape of the shoulder; but in this case, each collar must be adapted to each ox, and after all, some will chafe. Many have taken their opinion from Columella, who declares himself opposed to the use of the Roman yoke. But on the other hand, Herera, in his *Labranza Espagnolla*, condemns Columella's opinion as closet theory, and appeals to practice.

The commerce of the city of Bourdeaux is most extensive; nine-tenths of the labour is there performed by oxen under this yoke. Their common rates are three hogsheds of claret wine, brought from twelve to fifteen miles in the country to town, by one pair of oxen; four hogsheds in town to and fro; two puncheons of coniac brandy, two casks of St. Domingo sugar, weighing 2400 pounds, by one pair.

There lies an objection against the uneasy and seeming painful situation of the ox's head under the Roman yoke; but this is ideal, to a demonstration. See the annexed delineation of a cart, in its position of going up hill. When suspended by shafts on the horse's back, the angle BAC is made, which truly represents an addition in this case of *vis inertiae*, whereby the equilibrium made at loading is destroyed, and the *vis impressa* requires to be augmented in a ratio to the angle BAC . The oxen in this case naturally, with mutual consent, lower their heads, and preserve the equilibrium, as at DE , and vice versa in going down hill, having in this point the advantage of all other draft cattle. 'Tis true, oxen use their horns to bruise and drive off insects which attack their shoulders, while they defend the posterior parts of their bodies with their tails; but against this inconvenience a netting is a remedy obvious to the humane.

The foregoing observations have been, in a great measure, made by Marshal Saxe, chap. vii. of artillery and carriage.

The carriages of an army should be totally of wood, without any sort of iron-work about them, such as those of the Muscovites, and also those we see come out of Franche Comté to Paris. They travel from one extremity of the kingdom to the other, without damaging the roads. One man is sufficient to drive four with ease, each being drawn by two oxen only; ten of our carriages do more detriment to a road than a thousand of these. All the carriages of an army ought to be drawn by oxen; on account, in the first place, of their equality of pace; in the second, because they are attended with no loss; in the third, every situation will produce sufficient forage to support them; in the fourth, when they are maimed, others may be had from the magazines; add to which, a small quantity of gear is required, and that when the
army

army halts, they immediately find their natural nourishment. A single man and eight oxen will be able to draw more than four men with a dozen or fifteen horses; neither will they consume the forage which they should bring to camp, as the horses do, because they are left to pasture while the servants are gathering and loading it. The foregoing argument is founded on nature and reason; it is properly applicable to an army, but how much more to a nation?

The sandy desert betwixt Bourdeaux and Bayonne produces rosin, millet, and oxen, which when fat weigh four hundred pounds. The men resemble the other productions, they are small, but hardy. They use the small four-wheeled carriage, as above described, drawn by two oxen; their load, from the parts about Dax, twenty leagues distant from Bourdeaux, consists of fifty cakes of rosin, weighing from eighteen hundred to two thousand pounds. The oxen browse what they can along the desert. The carriage is over and above provided with some millet-straw, which the ox-hinds form into small bundles, putting into the middle of each two or three handfuls of bran, and thus are their oxen fed.

Nature is framed in œconomy, and exhibits the true system whereon to found the labour of man. As the use of oxen for tillage would diminish the consumption of oats, in a proportion to the cattle employed therein, it belongs to our subject to consider the importation of oats for seven years past, as follows; viz.

From

On LABOURING CATTLE.

From Christmas 1769 to Christmas 1776.

		Into the port of London.		Into out ports.	
Christmas 1769 to Christmas 1770.	95,843	—	13,346		
1770 ————— 1771.	176,708	—	21,358		
1771 ————— 1772.	63,717	—	6,810		
1772 ————— 1773.	183,816	—	49,158		
1773 ————— 1774.	268,529	—	43,974		
1774 ————— 1775.	201,716	—	79,154		
1775 ————— 1776.	381,601				
London		1,371,930		213,800	
Out ports		213,800			
Quarters		1,585,730			
At 16s. per Quarter			£. 1,268,584		

From this account it appears, that England does not grow oats in a quantity sufficient for its consumption, being the importation has been continued for a series of seven years. It further appears, that our necessity in this article annually encreases in a rapid manner, in a quadruple proportion in seven years. This is alarming.

These circumstances cannot be attributed to a failure of crops, because the last may be reckoned a good one for this grain, which notwithstanding maintains itself at a high price.

The training and conducting of oxen, require the continual exercise of the virtues of patience and humanity; they are sober, and so should their hinds be.—Granted, the pampered horse and driver can occasionally make prodigious efforts; but such violent exertions

are neither founded on the laws of nature or wisdom, any more than true courage or strength can be the effects of the intemperate use of strongly-fermented liquors.

A general system established on principles, whereby every single beast of labour shall convey one thousand pounds weight, with the least possible wear and tear of carriages and roads, may be considered as the ultimate of general practicability in this matter. Such an œconomy we may look to from oxen.—Voltaire has criticised the article *Ferme*, of the *Encyclopédie*, in these words :

“ In the article *Ferme*, which is one of the best of that extensive work, a distinction is made between the great and small culture. The great culture is said to be performed by horses, and the small one by oxen ; and that small one, which obtains over the greatest part of the lands of France, is looked on as a very unfruitful labour, and as the unprofitable efforts of indigence. This idea seems to me in general to have no foundation in truth. The culture by horses is little better than that by oxen. There are compensations between these two methods which render them perfectly equal. It seems to me that the ancients never employed horses to plough the earth. At least we read of nothing but oxen in Hesiod, Xenophon, Virgil, and Columella. Culture by oxen is bad and poor, only because land-proprietors, of indigent circumstances, stock their lands with bad oxen, in poor condition, putting them in the hands of dividers, without the means of being good husbandmen. Such dividers risking nothing, because they have no property in the stock, cannot do justice to the earth by manuring and tilling it well. They do not enrich themselves, and they beggar their masters ; and unhappily this is the case of many fathers of families. The services of oxen are as profitable as those of horses ; as their
“ pace

“ pace in the plough is slower, they can maintain it for a longer
“ time without being outdone. They cost less in their keep.
“ They are not to be shod. Their gear is less expensive. They
“ are at all times saleable, or may be fatted for the butcher: hence
“ in their life and in their death they bring advantage, which cannot
“ be said of horses. In fine, horses cannot be employed but
“ where oats are very plenty and cheap; and these are the reasons
“ why there is four or five times less culture by horses than by
“ oxen.”

In order that this reasoning be more generally understood, it may be proper to observe, that the mode which is prevalent in France, between land-proprietor and tenant, is for the proprietor to stock the farm, and the tenant to work, and divide the gross produce equally with the proprietor, in lieu of rent.

The province of Guienne in France, is certainly one of the most fruitful in grain as well as wine; the whole of their labour is performed by oxen. Culture of the vine, of wheat, carriage of goods and materials, are all performed by oxen. The exception of the trifles performed by horses is too insignificant to be mentioned. What is to become of the distinction of great and small culture in this province? On the other hand, where are the compensations to render tillage by oxen and horses perfectly equal? Four or six oxen can plough a statute acre per day, according to its strength of soil, to the depth of seven or eight inches, and perhaps deeper when required; what can six horses do more? Six oxen in these times may be bought for sixty pounds, six horses would cost double the sum; and then comes corn, and shoeing, and harness, and chains; also the strangles, and disorders without end.

From the earliest antiquity the ox has been the symbol of agriculture, the horse that of war.

CULTIVA-

CULTIVATION of WASTE LANDS, but more particularly the MOORS.

WHEN we consider the quantity of uncultivated acres in England, or when we view extensive tracts of moory land, in a state almost useless to the community, a question naturally arises concerning the means, consistent with a liberal œconomy, of peopling with flocks of cattle those desert wastes; for where the cattle are, corn and men will soon follow.

Moors, on their superficies, exhibit an incrustation of vegetables corrupted. Perfect rottenness, or a degree of the *putre solum*, is the effect of fermentation. Of vegetables there is a process, through the vinous and acetous, to the putrid state. Vegetables, when arrived to the acetous period, are observed to continue in it for a length of time. The revolving seasons adding still vegetables in their first state of corruption, the whole process is thereby retarded, and moors seem to acquire a permanent acid quality, unfavourable to vegetation. Heat, moisture, and vegetable substances, produce fermentation, and this a solution of parts or rottenness, unless retarded by the preserving acid. It seems probable, that lime absorbs acids, and thereby precipitates the process, to the final dissolution of vegetable substances. Animal substances contain smaller quantities of acids, and are on this account sooner dissolved.

Illa leges demum respondet avari
Agricolæ, bis quæ solem, bis frigora sensit:
Illius immensæ ruperunt horrea messes.

F

This

This observation is well founded on the evidence and practice of ages, and points out that the influence of the rays of the sun, of air, and rain, has powers to rot and mellow land, as well as dung-hills.

Dung, while left in the yard to steep in rain-water, if unassisted by the powerful efficacy of the daily excrement and urine of cattle, is known to make but a slow progress towards that putrid state desired; but husbandmen know how much the process is accelerated by a mixture of lime, or its substitute, putting it into heaps, and frequent turnings.

What is premised being duly considered, it is from thence deducible, that moor-land first pared and burnt, may, by repeated expositions to the alternacies of the weather, be so far rotted and mellowed, as to become kind and genial in its nature, and produce a crop of turneps to be fed off by sheep, a subsequent crop of tares likewise fed off, and thus may be redeemed for ever from that inert state in which it is placed by nature.

This is not mere theory; a winter crop has been raised from a four dead clay, by this means, followed by an excellent crop of tares fed, and as good a crop of wheat. In this instance the ashes, by burn-baking, were wanting to constitute the compleat moor system.

The ash, by its calx generated in the burning, has evidently, so far as it goes, powers similar to those of lime, and therefore makes a plausible part of the moor-husbandry.

In pursuance of the foregoing reasoning it is proposed, after the burn-baking of moor-land, and spreading the ash, to substitute

various expositions to the sun and air, by repeated but easy operations, instead of lime, to obtain our end of sweetening and mellowing this soil; because liming is most expensive, and in many cases impossible, on account of the distance of carriage, want of fuel, &c. The next question that occurs is, What may be the best system of œconomy to attain to the end proposed? It is observable, that the borders of these waste tracts are generally doubly blessed by the hand of bounteous nature. Hay is commonly a cheap commodity in the adjoining inclosures. Let us avail ourselves of this advantage, and endeavour to substitute all labour of man, and growth of cattle, to a more distant labour, and the growth of a cattle less valuable than the ox.

A team of six oxen may be kept for about thirty tons

of hay one year, at full allowance, at 5*l*.

75 0 0

A ploughman and boy, at 13*s*. per week

— 33 0 0

£. 108 0 0

Their gear and ploughs are a part of stock which remains over. This allowance is made before any better system of œconomy can take place, when all is as yet waste, simply inclosed, and burn-baked, the ashes being spread. After a deduction for holidays and winter, their labour may be accounted at two hundred days, or ten shillings per day for the team.

No science is more useful than that of numbers, yet the immoderate use of them is fraught with deception: in matters of this kind, were it possible to advance one step without their assistance, we should dismiss them. On this shore we must endeavour not to quit soundings.

The inclosure of moor-land, with such materials as the situation presents, especially the stone wall, is the first object to be considered, and will make the first article in the account. This has been reduced into practice, and is of such a nature as to admit of the best investigation from persons on the spot, who must be the best judges of the circumstances attending the various situations.

The burn-baking is in most respects similar, being reduced to a general standard, adequate to the population and means of the divers counties where it is in practice. It will form the second article in the account.

The moors are generally friable loose soils. Immediately after spreading the ash, it is proposed to ridge them in with the double mold-board plough, three off or near oxen walking still in the last furrow.



The point of the share should be stuck in as near as possible two feet from the center of the former furrow; the number of furrows being thus compared with clean ploughing only, is as one to three. Between two and three acres may be thus ridged per day; say only two, this ridging will be 5s. per acre.

This work may go on let the weather be what it may, the violent rains and frosts of winter excepted.

The boards of the plough must be adapted to the genius of the soil, by being wide over the fin in the friable sort, to earth up high, and narrower in the stronger, to make its way easier through the tenacity of it.

After the alternacies of weather for a month or two have acted on the soil, whenever to the eye of the attentive husbandman it shall

shall appear that he can make more mold, let him go in the furrow with the hoe drawn by two oxen, and follow ridging higher, with four oxen to the double plough. This operation may be done at the rate of five acres per day; a charge will thereby be incurred of two shillings for team, and two shillings extraordinary man and boy, is four shillings per acre.

This operation, at a well-judged distance of time, may be repeated at a further expence of four shillings per acre.

After this should follow a splitting of the first ridges



The oxen with the double yoke walking in the furrows, should plough the intermediate ridge, attended with an expence of ten shillings per acre; followed by two hoeings and ridgings, eight shillings per acre.

RECAPITULATION OF THESE OPERATIONS.

Making the Year of Fallow.

First ridging	—	o 10 o
First hoeing and ridging		o 4 o
Second ditto	—	o 4 o
Splitting	—	o 10 o
First hoeing	—	o 4 o
Second ditto	—	o 4 o

£. 1 16 o

This is a year of fallow, at 36 shillings per acre, which may be perfected by Midsummer following the burn-baking. The ridges  are then to be rolled, oxen walking in the furrows, and a double row of turneps sowed by the sowing-plough on every other ridge, leaving one intermediate to be hoed and earthed up to the double row, by splitting with the double mold.

mold-board plough. Ye attentive men of practice, shall we have turneps? 'Tis possible, 'tis probable. If so, we have run the race. Where turneps have been fed, tares will grow; where tares, corn will follow; oats and grafs-seeds may be sown; oats seem to be the *Cerealia* most natural to the moors.

To the foregoing system an objection will arise, That by the two ridgings a clean tilth has not been obtained. Granted; notwithstanding most of the effects of two ploughings are obtained in one respect, and in another many advantages are gained, which would not arise from two tilths. At every operation, a fresh compound of the growth of vegetables, or of earth which was exposed to the influence of the sun and air, is obtained, and thereby a fermentation of the whole mass arises of the earth, which is turned, and of the remaining substratum. Thus the desired effect of rotting or ripening the soil is forwarded.

In the case of a clean tilth before winter, experience teaches, that the rains of autumn soon batter down and flatten the soil, in such a manner as to render it impervious to that variety of influence to which it is exposed by the ridging. Gardeners justify this theory by their constant practice.

No invention by rolling and harrowing, or any other, can approach to the pulveration or tilth, to be made by the hoeing and earthing with the ridging double mold-board plough.

No notice has been taken of buildings; they are to be best understood on the spot, where the most obvious materials will always be the cheapest. However the coupe of an ox-house, *per plate*, being in a peculiar manner adapted for such a situation, and on a principle of a liberal œconomy, an exact design is here given of it.

Its

Its cheapness consists in the quality of the timber, which is all of one dimension, being the ew-firs as imported.

Its solidity is owing to its butments, made of the earth thrown out of the plan, when it was made level to the line of the horizon; and likewise to the perpendiculars under the middle bearing of the rafters; and the whole of a lightness which, more than is commonly imagined, contributes to the duration of buildings.

The oxen will not lose in value, except what may accrue from accidents. Their gear is simple, durable, and of a trifling value.

The first turnep crops may possibly not be the best; but if they do but apple kindly, 'tis well. The young stock on a young farm can fare hard, and a reserve for the months of March, April, and May, is a talent laid out at compound interest. Cattle can fight through winter; but spring is the time when the experienced husbandman will unhoard his hidden treasure, to prepare his cattle against the attacks of the first growth of grass.

When cattle are under the hand of poverty, the very mucus of their bowels comes to their assistance, to light up the spunk of life, and become thus exposed to the chilling blights of the first grass; and even in this there is the wisdom of nature, for else they would burst by surfeits.

No notice has been taken of the shares of the ploughs, but 'tis to be understood, that their form must be answerable to the soil they are to act in.—Fins cannot work easily where the land is very stoney; therefore round-pointed shares should in this case be used, and other changes made agreeably to the circumstances of the soil.

F I N I S.

To be SOLD;



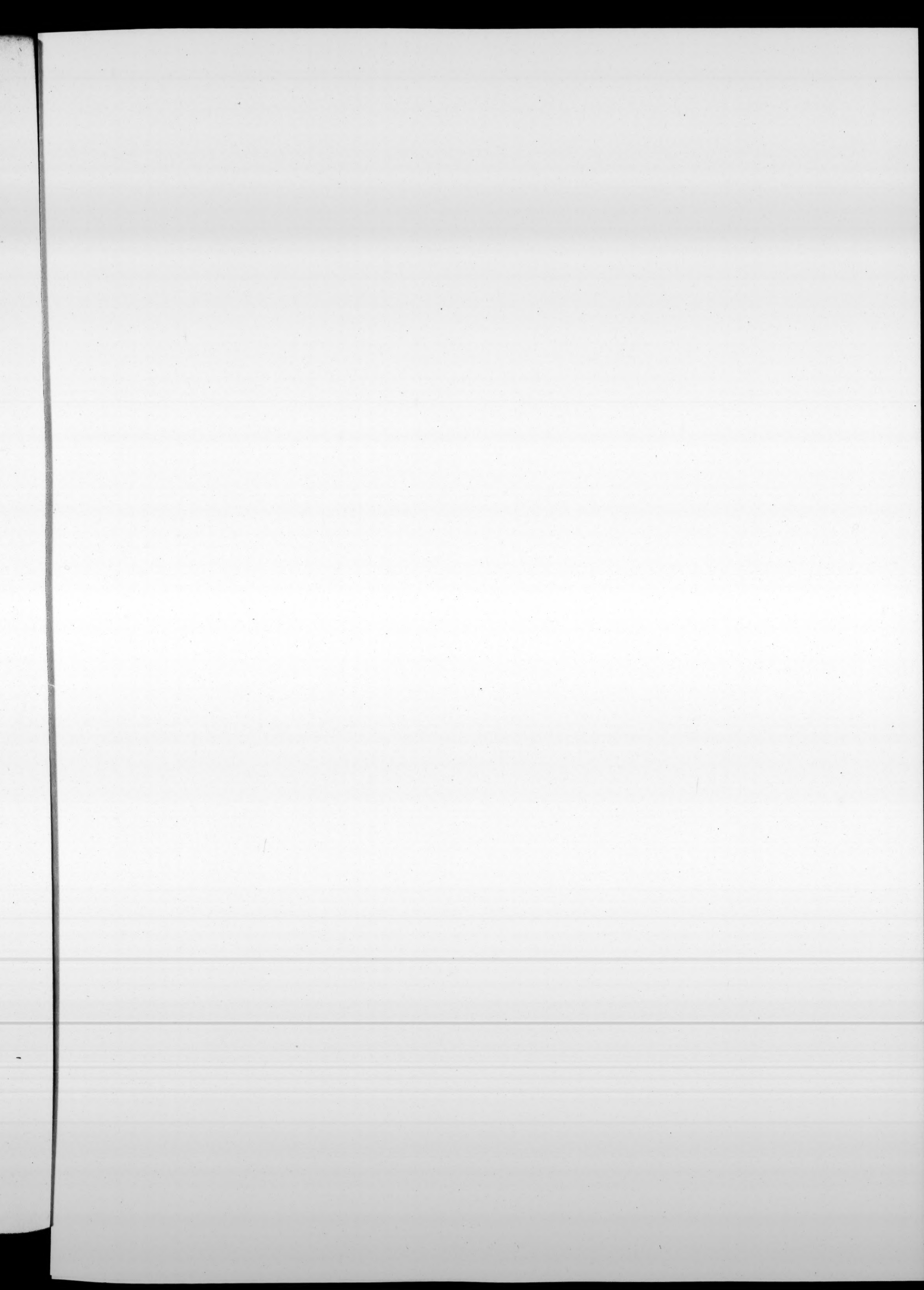
THE LEASE of a FARM of 133 Acres of Land, conducted on principles analogous to these observations; which, if continued through the last year of the course, will exhibit an object worthy the attention of husbandmen, more particularly of such who farm on the clays and strong lands; viz.

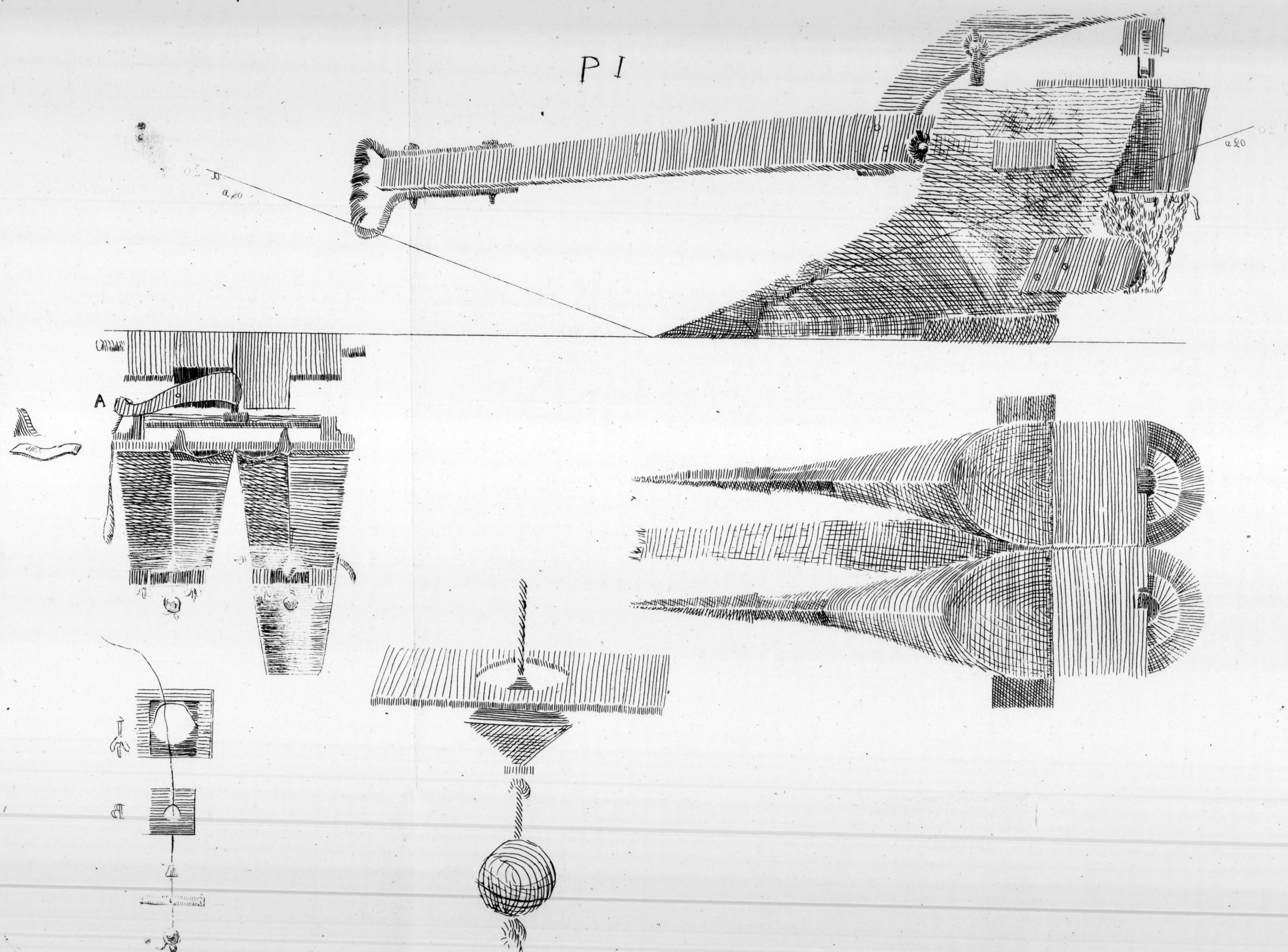
Anno

1774—5	It was ploughed with four horses	25 acres wheat
1775—6	Ditto four oxen and four horses	45 wheat
1776—7	Ditto twelve oxen —	45 wheat
	Summer corn, beans, &c. —	50
1777—8,	Last year, twelve oxen to plough and fow —	100 acres wheat

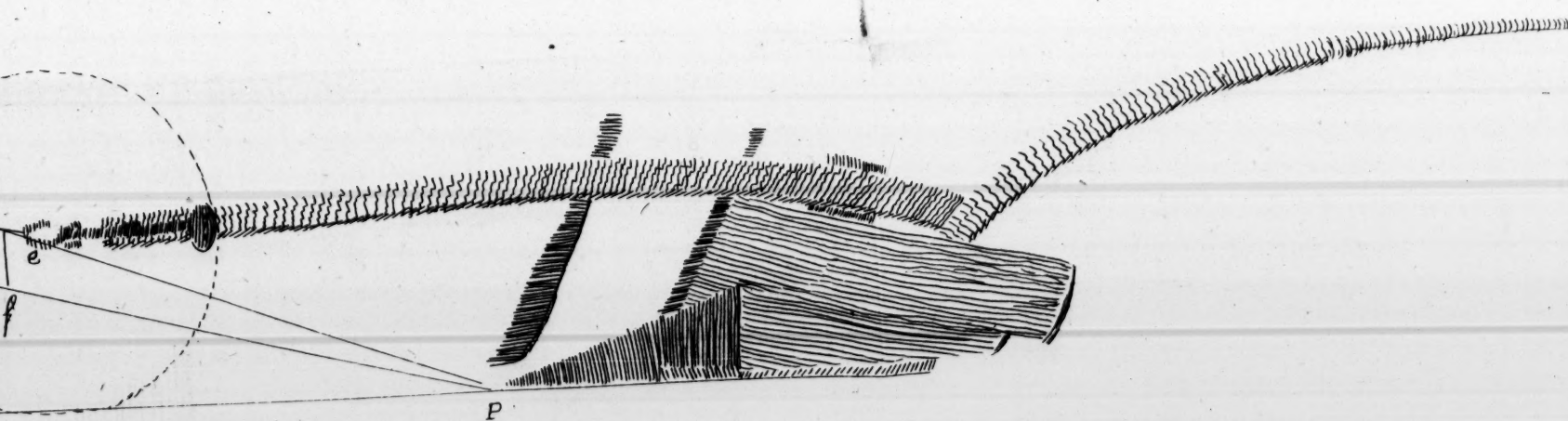
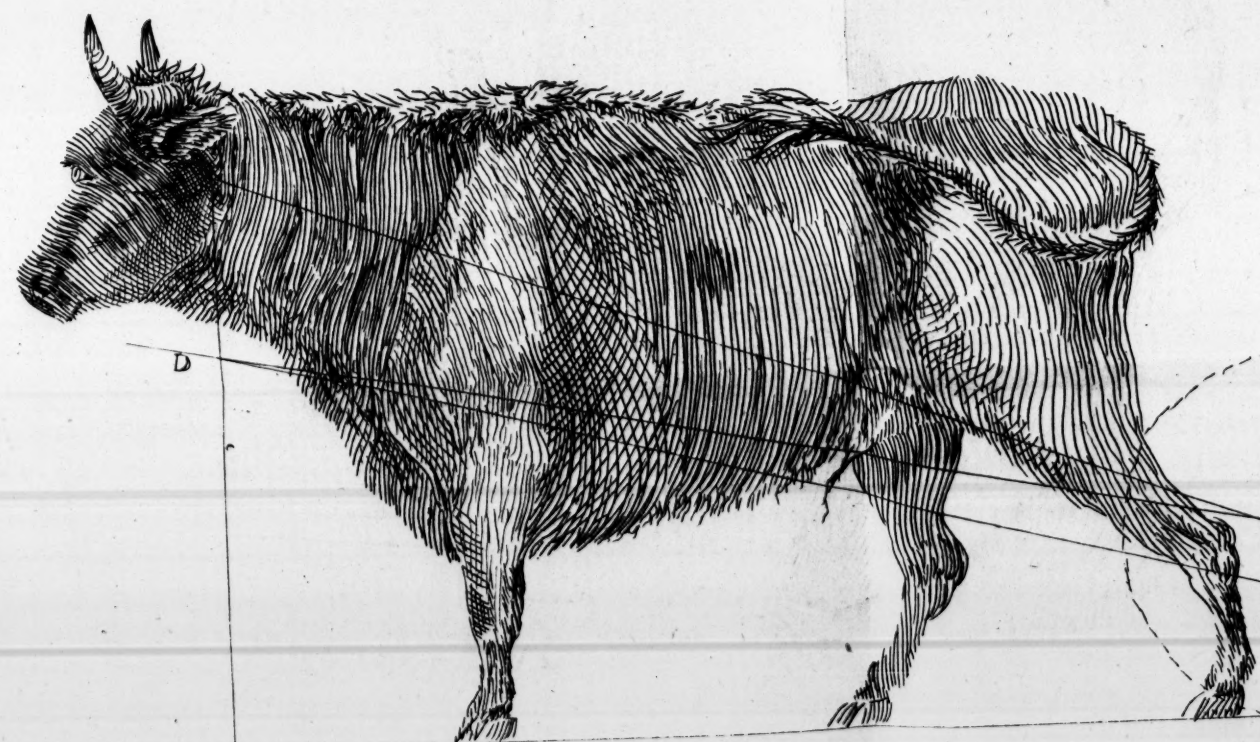
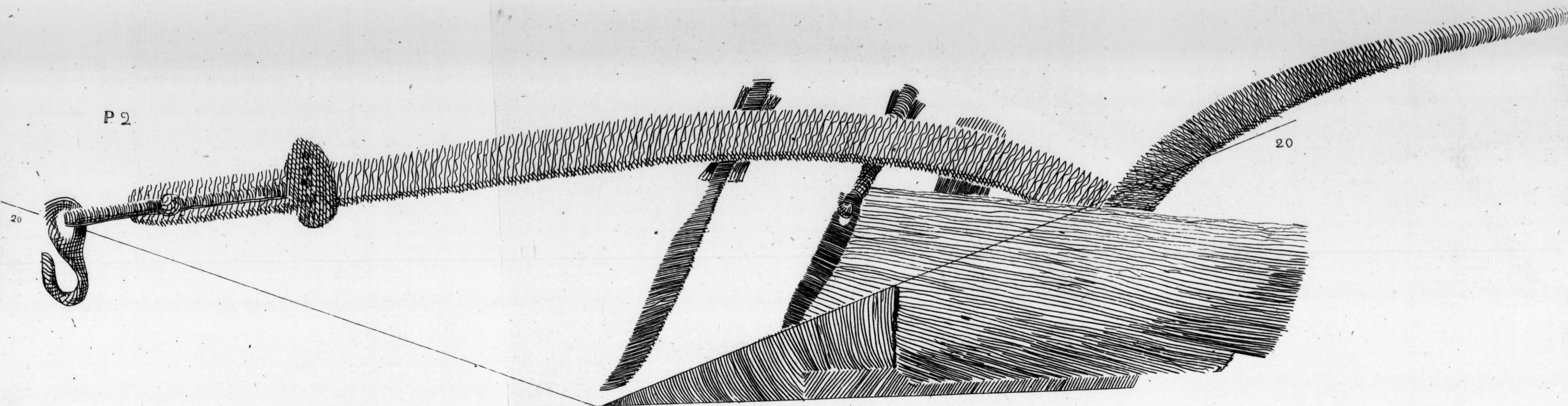
From this epocha forward this farm may be sowed annually to wheat, by carrying the dung and manure on the head-lands, and by ploughing it and mixing it thereby with the soil, and by carrying the head-lands into the fields.—The whole summer may be dedicated to this preparation of the head-lands.

The remaining 33 acres may soon be so improved as to keep twelve oxen, fattening of six, and buying or breeding six every year, by means of lucerne, which succeeds very well on this soil.

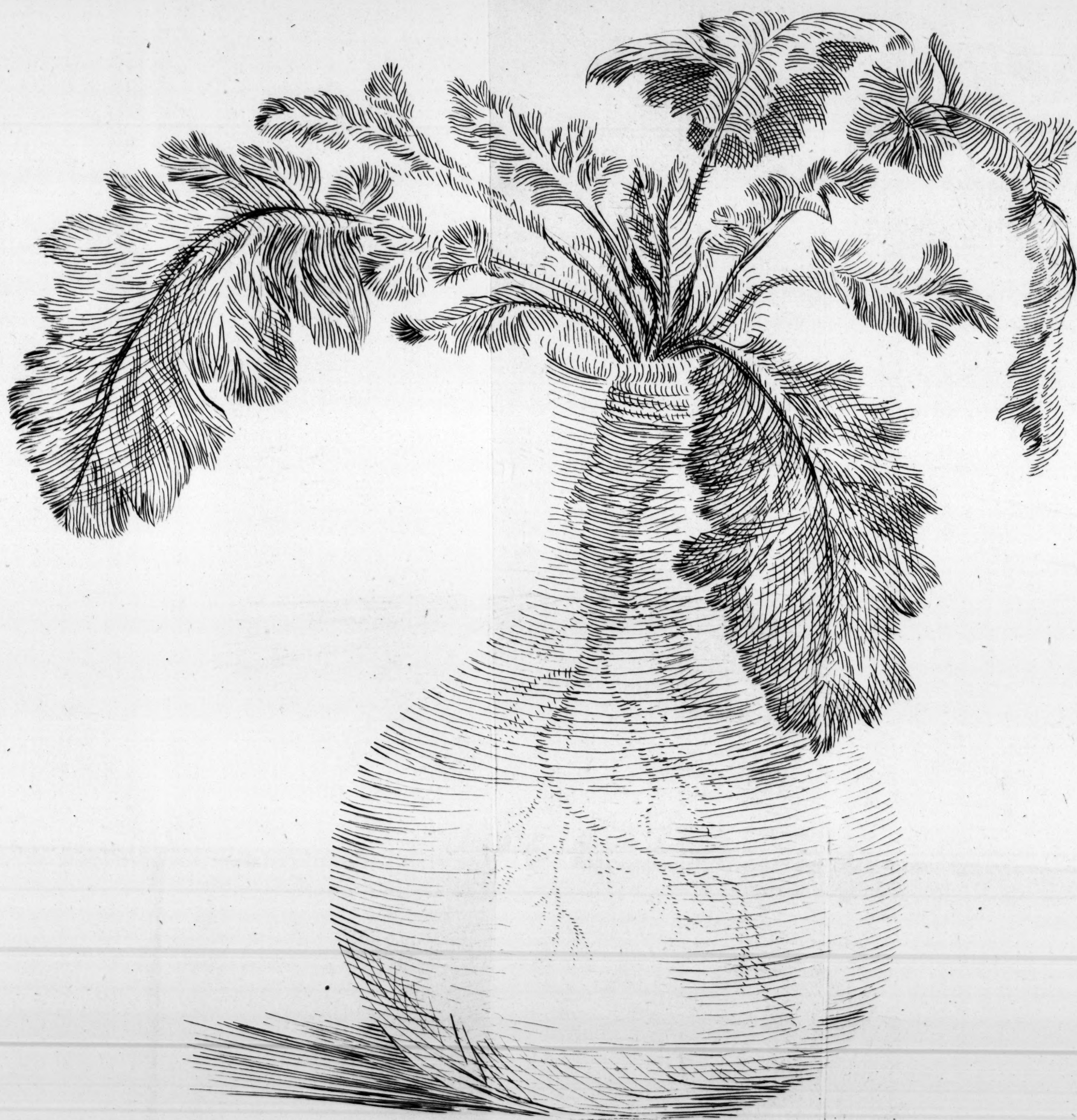


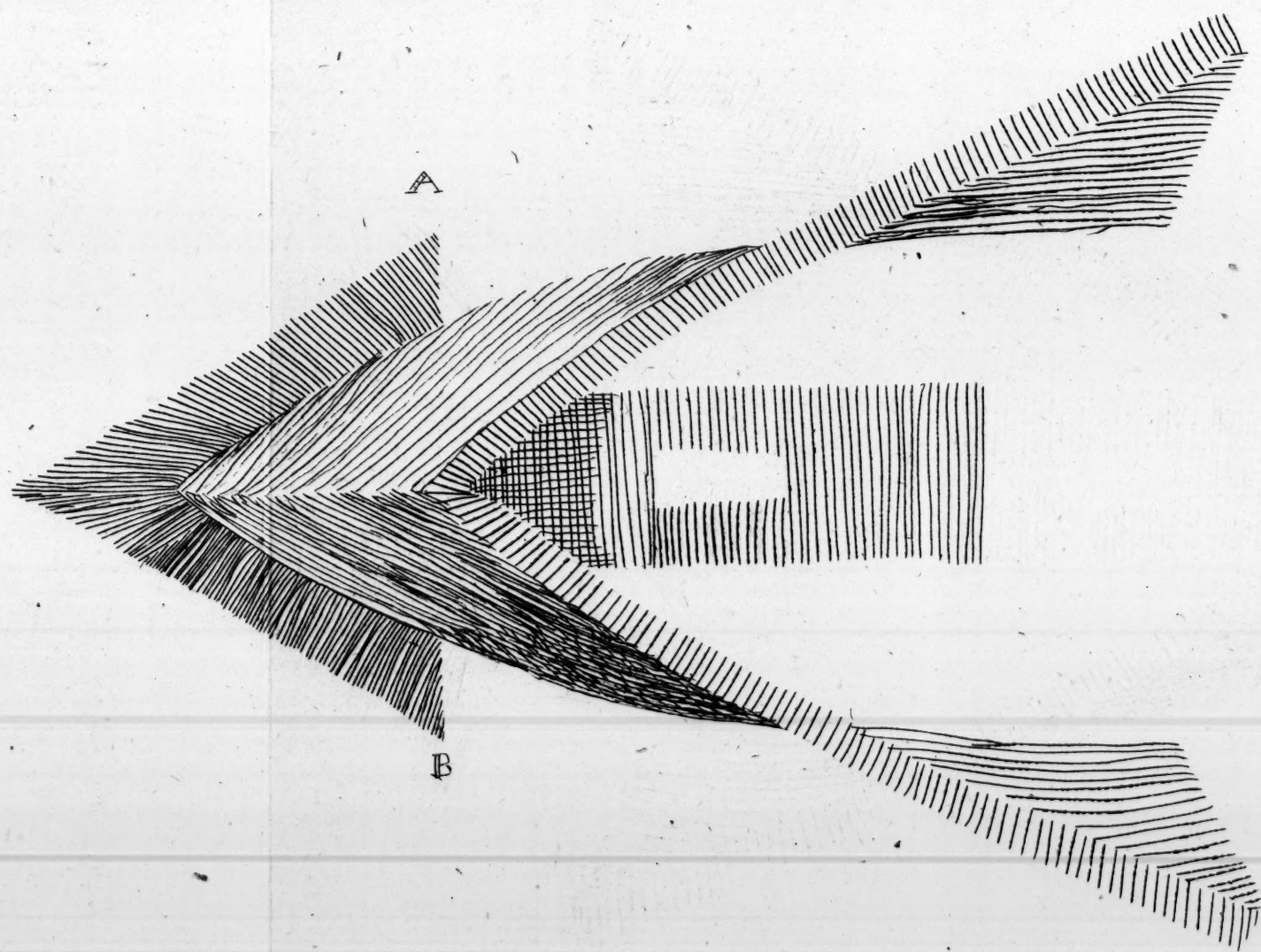
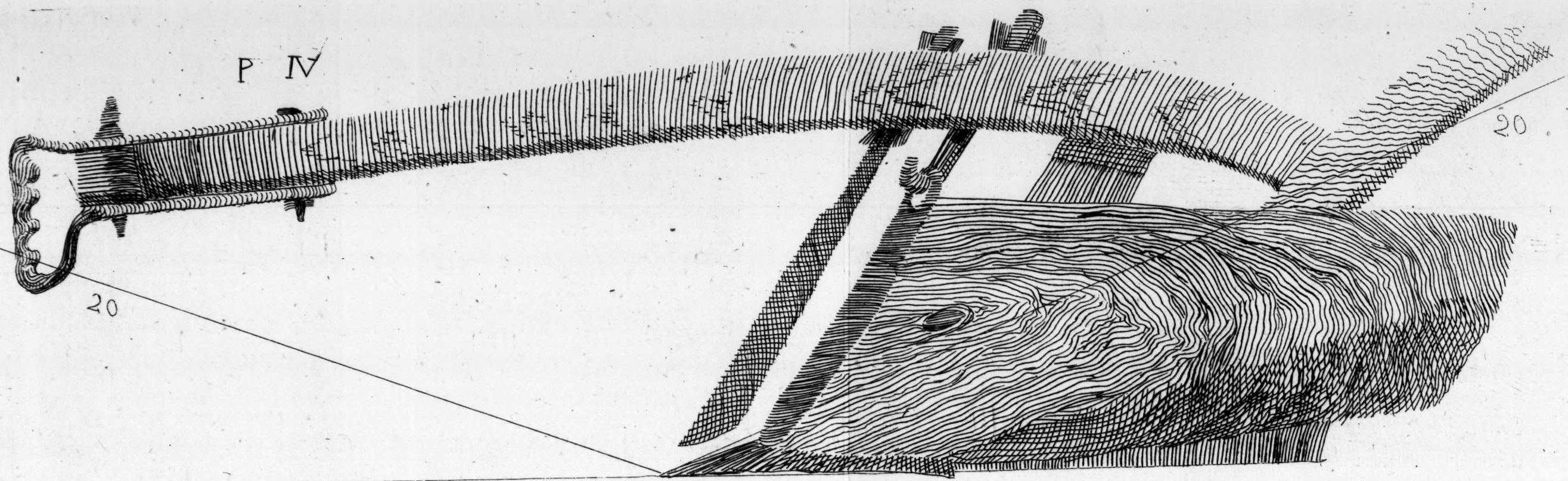


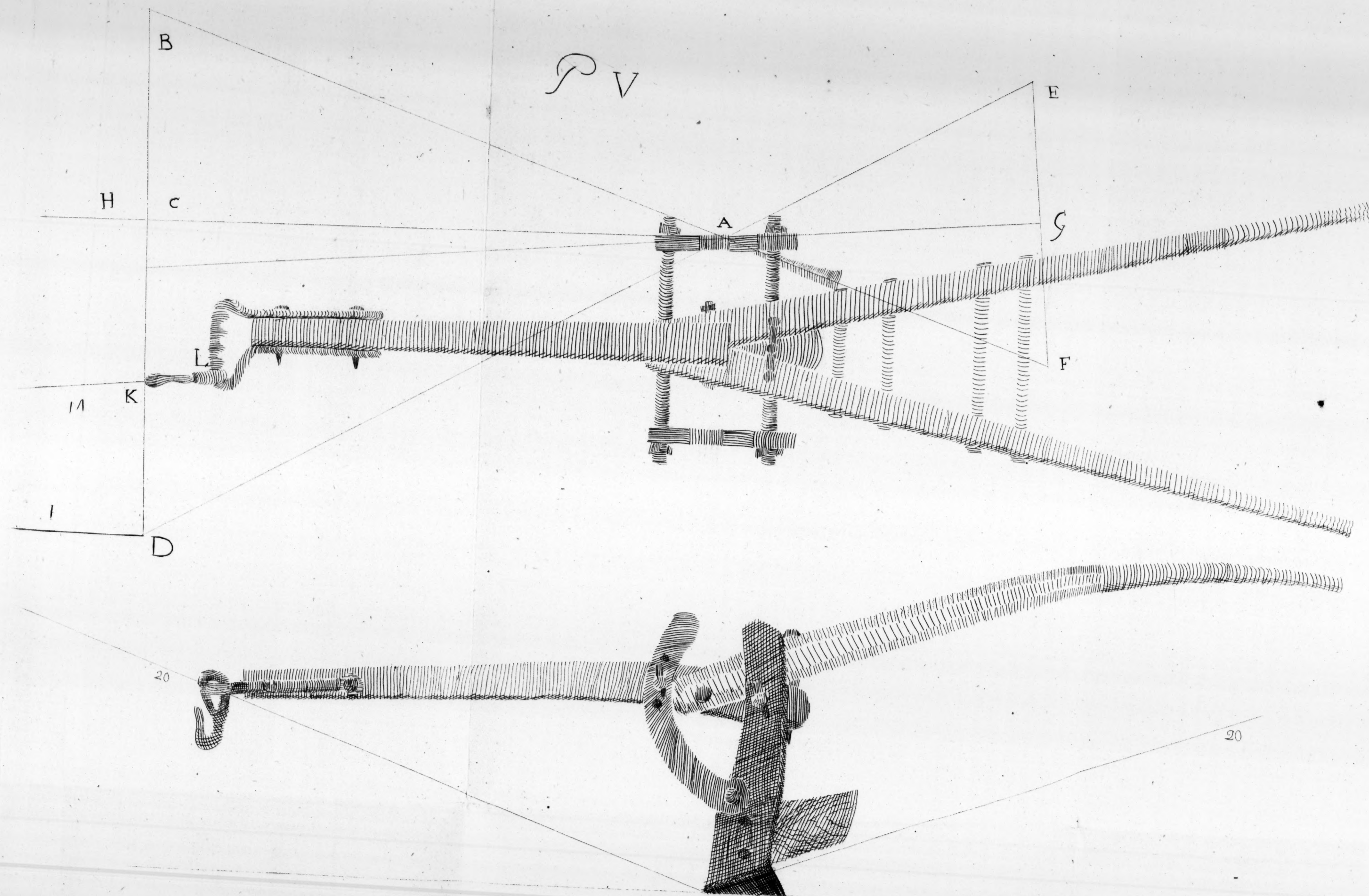
P 2



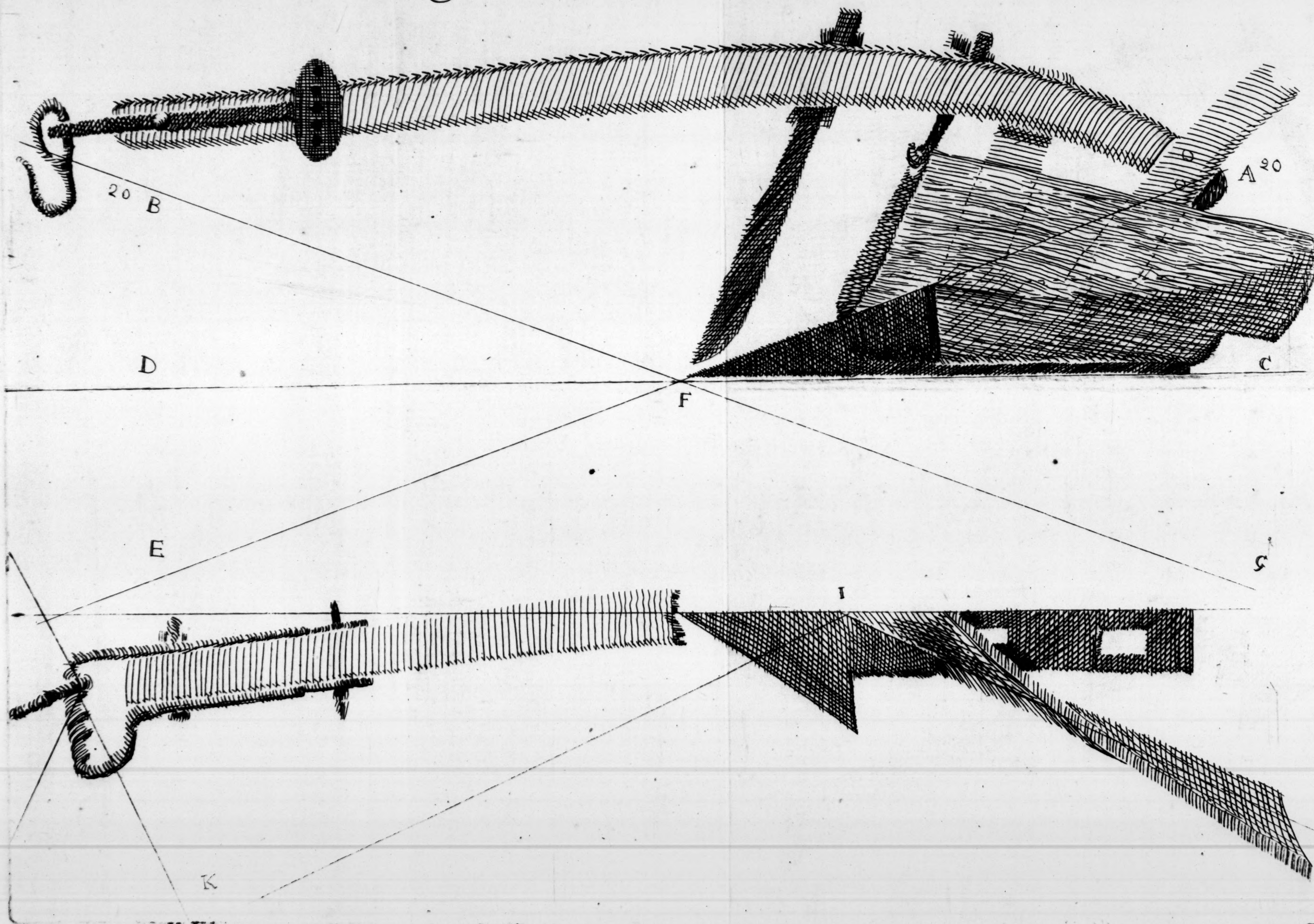
P III







P. VI



P VII

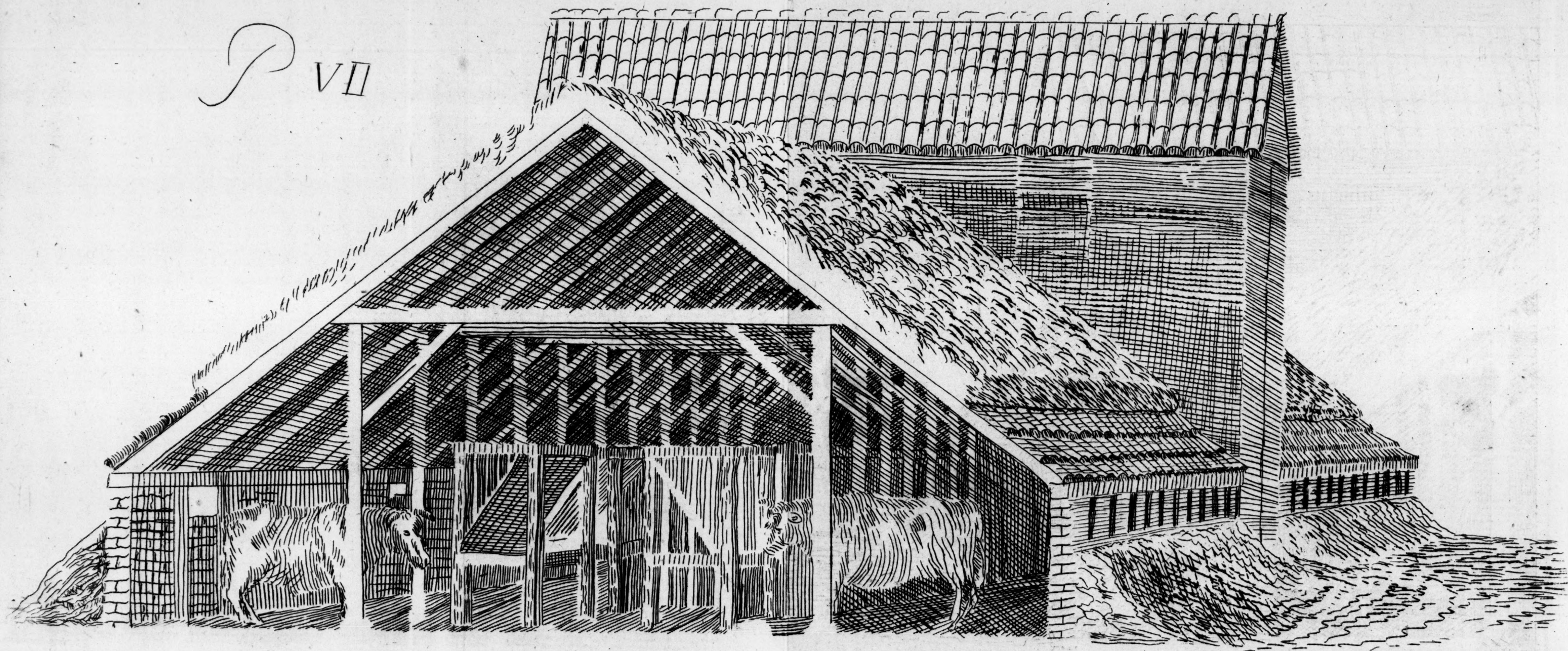
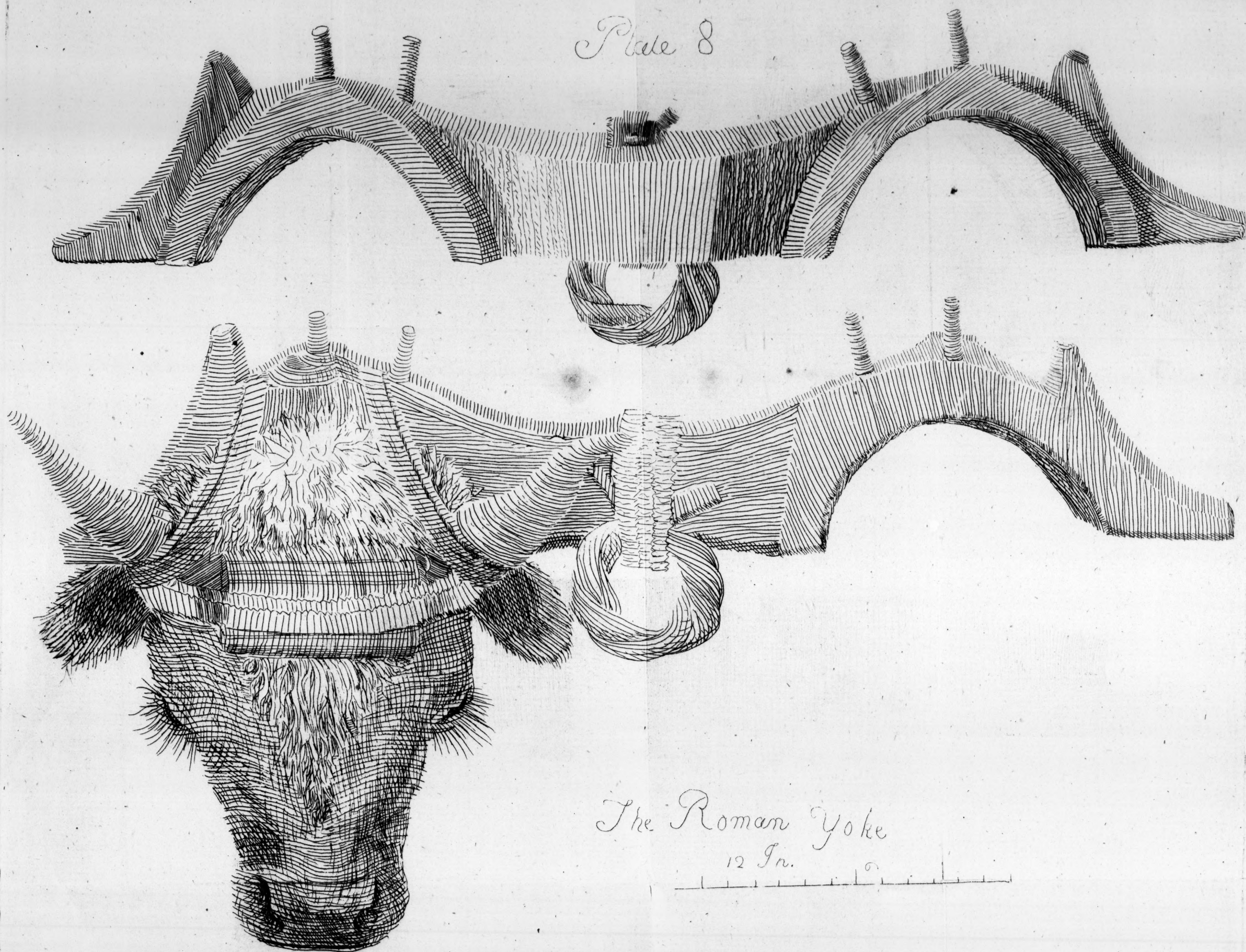


Plate 8



The Roman Yoke
12 In.

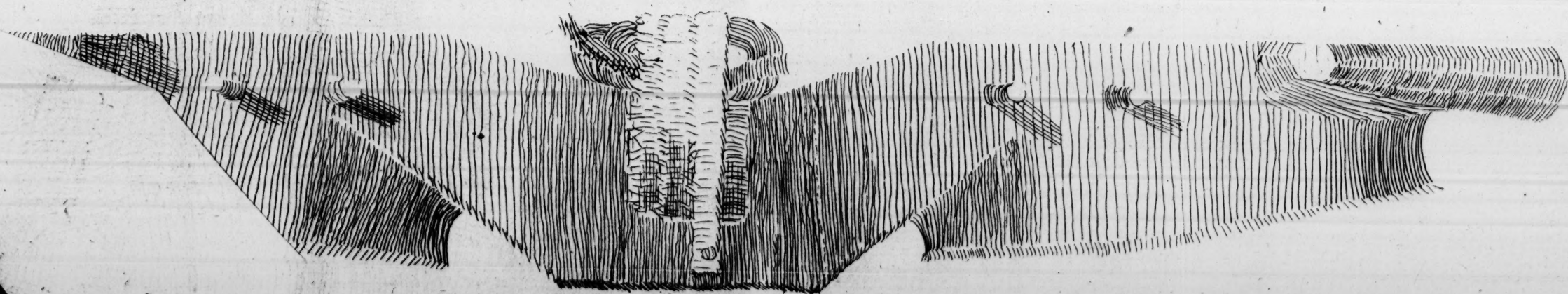
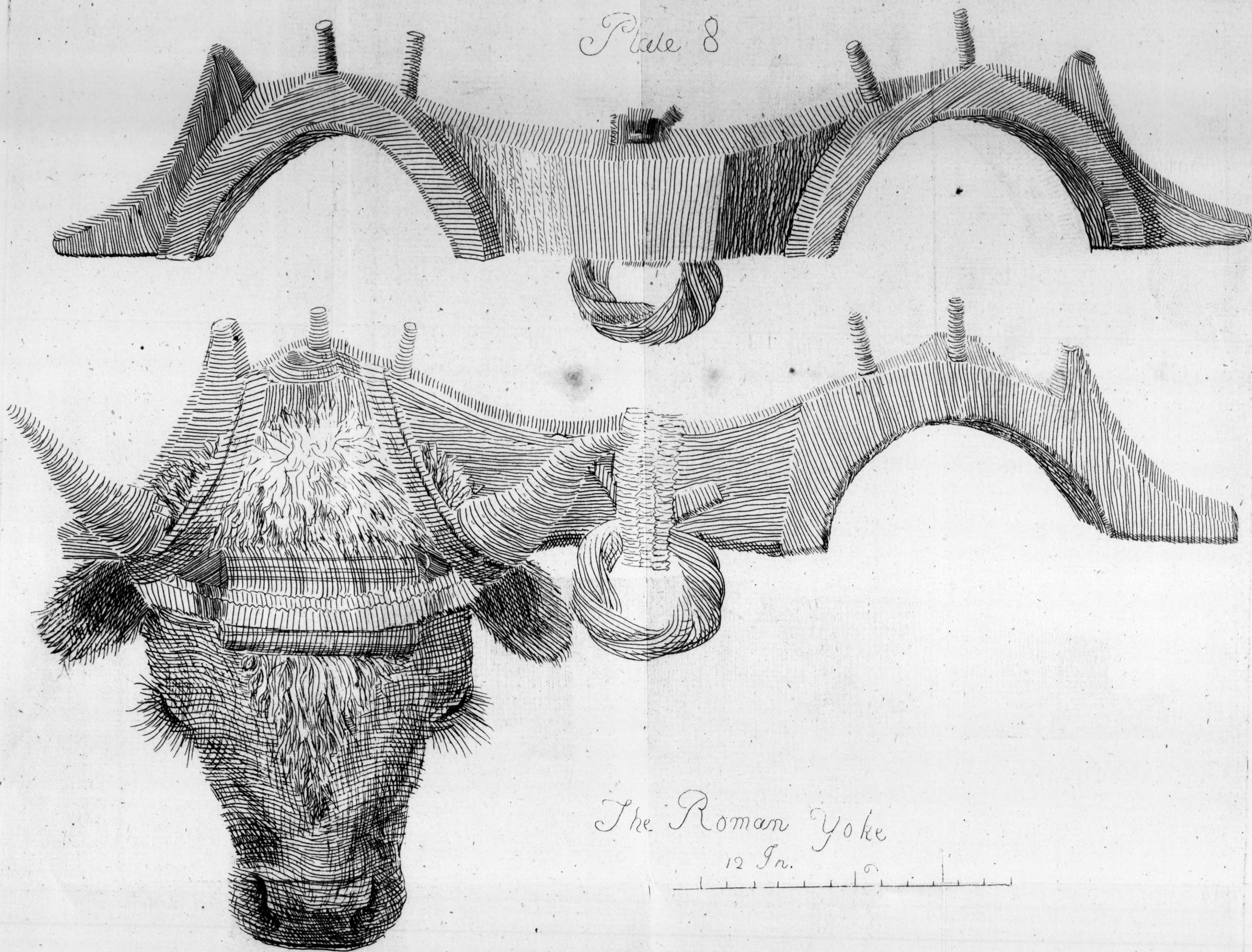


Plate 8



The Roman Yoke
12 In.

